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Assessing Forest Service Recreation Trends With Shift-share Analysis

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Abstract—Shift-share analysis is used to describe recreation growth in the Regions of the Forest Service, U.S. Department of Agriculture, between 1970 and 1989. Growth is partitioned into three components: national trend, recreation mix, and regional competition. National trend accounted for nearly all recreation growth in slow-growing regions. Shifts in regional competitive position accounted for much more recreation growth than did recreation mix. Substantial recreation use shifted from the Northern States to the Sunbelt States.

Keywords: recreation growth, regional growth, recreation use, regional science, forest recreation, active recreation, domestic tourism, recreation management

Rural America is increasingly looking to outdoor recreation and tourism to counter economic downturns suffered during the 1980's. In fact, many rural development efforts of the Forest Service, U.S. Department of Agriculture, center on recreation-based activities (USDA FS 1990). The Forest Service national research program on enhancing rural America (USDA FS 1991) cites recreation-based activities as a means of broadening economic opportunities and diversity.

Communities and regions must thoughtfully assess recreation-based rural development opportunities. All forms of recreation cannot be the key to economic growth for all places in rural America. Some locations have advantages over others. Some forms of recreation are on the upswing, while others are stagnant or in decline. Planners in rural communities need tools to help them identify promising opportunities for recreation-based economic growth.

Shift-share analysis is one such tool. Normally used to describe patterns of regional industrial growth, shift-share analysis owes its appeal to simplicity and its ability to help unravel complex patterns of change in time-series data. As the name suggests, shift-share analysis describes regional growth in terms of regions shifting their share of industrial activities. Regions can be as large as the Great Plains or as small as a couple of counties, or a community. Industrial sectors vary in specificity, but typically represent well-known activities, such as manufacturing lumber and wood products. Growth (positive or negative) is often measured as change in employment, income, or value-added.

This paper applies shift-share analysis to regional recreation growth occurring on National Forests during the decades of the 1970's and 1980's. This application requires no modification to the concept of region. The industrial sectors are reinterpreted as types of recreation, such as hunting. Change in recreation use becomes the measure of growth.

BACKGROUND

According to Hoover (1971), shift-share analysis originated in 1942, but did not receive much attention until Perloff and others (1960) published their major work, "Regions, Resources, and Economic Growth." Since then, a number of articles have been published in the regional science literature (see Andrikopoulous 1980; Arcelus 1984; Barff and Knight 1988; Haynes and Machunda 1987). Although shift-share analysis has been applied to a wide variety of situations, including world growth patterns (Sihag and McDonough 1989) and crime rates (Blair and Marby 1980), its application to a natural resource setting has been limited. Kaiser and Dutrow (1971) and Dutrow (1972) applied shift-share to the timber industry. Brown (1980, 1981, 1982) used it to assess changes in tourism.

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In describing shift-share analysis, Richardson (1969, 1978) identified a basic premise: growth (or performance) of an individual region can only be assessed in the context of a larger geographical reference, commonly the Nation. In the context of recreation, shift-share partitions a region's total recreation growth into a "national trend" component, a "recreation mix" component, and a "regional competition" component. A region's shift-share model sums each growth component over all i sectors:

$$TC^r = \sum_i NT_i^r + \sum_i RM_i^r + \sum_i RC_i^r$$

where

- TC^r is total growth in region r over a time period
- NT_i^r is the national trend component of growth in sector i in region r
- RM_i^r is the recreation mix component
- RC_i^r is the regional competition component of growth.

The national trend component of regional growth (also called the base growth effect) portrays how a region's recreation use would have grown if it had grown at the same rate as the Nation. The recreation mix component (also called the proportional shift or compositional effect) measures the influence of the mix of recreation activities on regional growth.

If the recreation mix component is positive, the region's mix of recreation sectors has above-average levels of growth. The regional competition component (also called the differential shift or the relative share effect) reflects competitive position, measuring the degree to which a region's recreation sectors grew faster or slower than their national counterparts. If this component is positive, sectors in the region are performing at a higher level than those in the Nation.

METHODS

This study developed recreation equivalents for the standard components of shift-share analysis: regions, activities, and a measure of growth. Recreation use data were obtained for each of the Forest Service's nine Regions and for each of the nine recreation categories. Forest Service personnel provided the data from the Recreation Information Management (RIM) system for the years 1970 and 1989. Implemented in 1965, RIM is the only source of information breaking down Forest Service recreation by year, by region, and by recreation category.

Figure 1 shows the nine geographical regions used in this study. Although each region corresponds to an administrative region used by the Forest Service,

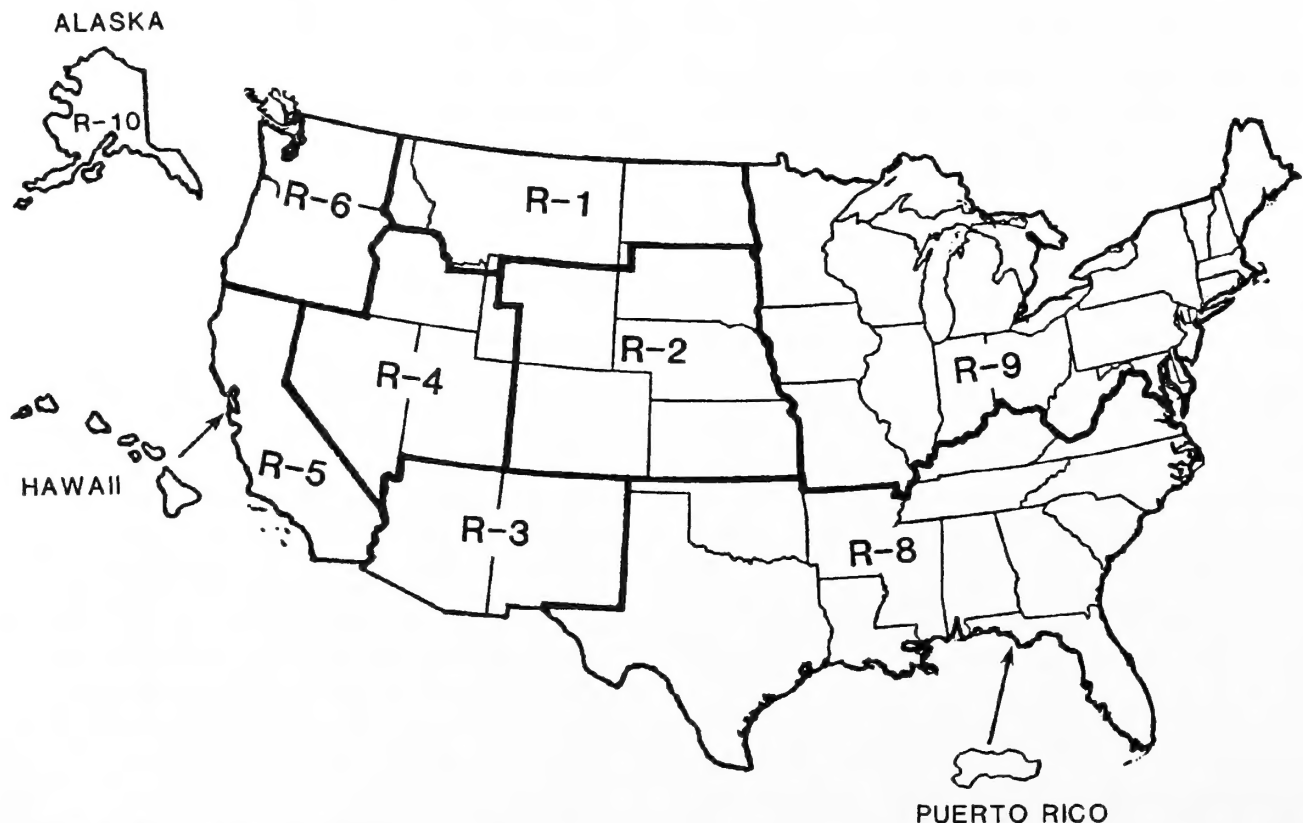


Figure 1—Forest Service administrative regions.

Table 1—Regional (G_i^r) and national (G_i^n) growth rates, 1970–89

Recreation category (<i>i</i>)	Region (<i>r</i>) ¹										<i>G</i> _{<i>i</i>} ^{<i>n</i>}
	1	2	3	4	5	6	8	9	10		
	----- Percent -----										
Camping	6.7	29.3	89.1	60.0	−0.2	25.3	35.4	7.4	12.1	24.3	
Mechanized Travel	28.4	93.8	199.7	46.5	89.1	42.0	56.2	−8.9	368.9	67.9	
Nonmechanized Travel	189.1	172.8	204.9	131.3	101.3	62.0	185.4	102.5	213.8	126.7	
Fishing	−5.5	19.7	55.5	−14.9	−7.5	−37.3	46.3	12.7	118.8	3.1	
Resorts	−38.0	2.9	−4.2	0	−9.5	−11.8	−25.6	20.0	65.8	−7.9	
Winter Sports	176.8	297.1	240.7	117.7	167.8	76.2	178.1	97.8	220.5	165.4	
Hunting	6.5	54.1	51.6	13.3	−15.0	−6.3	24.2	.4	−20.1	12.1	
Nature Study	260.8	55.6	118.4	—	30.2	6.6	300.8	197.6	411.0	90.4	
Other Activities	267.5	214.2	293.4	162.7	204.7	368.5	186.0	137.2	227.9	233.5	

¹The Forest Service has no Region 7.

shift-share analysis could also use individual States, National Forests, or Ranger Districts as regions.

Instead of focusing on industrial sectors, this study used categories of recreation activities, as defined by the RIM system. Because data specificity varied over time, a set of nine categories were adopted:

- Camping (including Picnicking and Swimming)
- Mechanized Travel (including Viewing)
- Nonmechanized Travel
- Fishing
- Resorts (including Cabins and Camps)
- Winter Sports
- Hunting
- Nature Study
- Other Activities

The Other Activities category includes visitor interpretive services such as viewing exhibits, gathering forest products such as Christmas trees, and sports and games.

Growth was measured by change in the level of reported recreation use, measured in Recreation Visitor Days (RVD's). Adopted by the Forest Service in 1965, an RVD is recreation use on National Forest land or water aggregating to 12 visitor-hours, individual or group, continuous or intermittent. Growth was measured over the 20-year time period, 1970 through 1989.

Shift-share components of recreation growth were calculated for each recreation category *i* and geographical region *r* as follows:

$$NT_i^r = U_i^r(G^n)$$

$$RM_i^r = U_i^r(G_i^n - G^n)$$

$$RC_i^r = U_i^r(G_i^r - G_i^n)$$

where *U* refers to recreation use at the beginning of the period and *G* refers to growth rates in region *r* or the Nation *n*. G^n was 46.3 percent and values for G_i^n and G_i^r are shown in table 1.

RESULTS

Figure 2 shows that recreational use of National Forests rose by about 80 million RVD's from 1970 to 1989, a 46 percent overall increase, averaging 2.3 percent annually. Use rose to two peaks, one in the early 1980's and the other in the late 1980's. Table 2

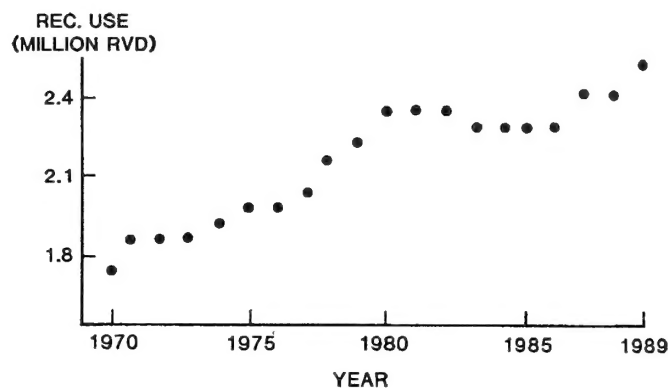


Figure 2—National recreation use levels, 1970-89.

Table 2—Regional recreation levels measured in recreation visitor days (RVD's) and rankings, 1970 and 1989

Region	1970		1989	
	RVD's	Rank	RVD's	Rank
	Thousands		Thousands	
1	10,150	8	13,283	8
2	16,159	6	29,525	3
3	11,940	7	26,463	6
4	18,736	5	27,720	5
5	46,770	1	62,992	1
6	28,012	2	36,377	2
8	18,917	4	28,359	4
9	20,332	3	23,140	7
10	1,538	9	4,636	9
Nation	172,554		252,495	

shows that recreation use in all regions increased during this time period, but there was a shift of recreation from the North and Northeast (especially Region 9) to the South and Southwest (especially Regions 2 and 3). Shift-share analysis helps assess these regional trends.

During the decades of the 1970's and 1980's, national recreation use levels grew for most categories of recreation. Winter Sports and Other Activities had the largest increases (about 126 percent and 233 percent, respectively), while Resorts and Fishing had the lowest changes (about -8 percent and 3 percent, respectively). These differential growth rates are important to describing regional recreation growth.

Table 3 shows the results of a shift-share analysis of recreation use between 1970 and 1989. Several points should be noted. First, although recreation in Region 5 grew by the largest amount (16.2 million RVD's), Region 10 experienced the largest percentage change (201.3 percent). The table's next three columns partition the total growth according to the effect of national trend, recreation mix, and regional competition.

The national trend component shows the amount of change in recreation use levels each region would have experienced, if each had grown at the national rate. For example, if the 1970 level of recreation in Region 1 had grown at the national average, it would have increased by 4.7 million RVD's by 1989. For regions that grew slower than the national average, the national trend component of recreation growth exceeds the total change in recreation use, as in the case of Region 1.

Some types of recreation grew faster than others. Regions that concentrate on "fast-growing" recreation tend to experience faster growth than regions concentrating on "slow-growing" recreation. The recreation mix column of table 3 shows that the mix of recreation activities emphasized by Region 5 contributed to a loss of 2.1 million RVD's of recreation use. During the 1970-89 period, Region 5 lost about 4.5 percent (2.1 million RVD's) from its 1970 level of recreation (46.8 million RVD's) because it emphasized slow-growing types of recreation activities. Similarly, about 27.0 percent (0.8 million RVD's) of the recreation growth in Region 9 resulted from its specialization in fast-growing recreation. Regions with a positive recreation mix have, on balance, a degree of specialization in fast-growing recreation that is favorable to rapid recreation growth.

Table 4 elaborates on the sources of recreation mix change. It shows that Region 5's recreation mix loss was largely due to specialization in the Camping and Resorts categories, both slow-growing forms of recreation. Region 5 did not have enough growth in fast-growing recreation to offset the pace set by slow-growing recreation. Region 6 also had substantial slow-growing recreation, such as Resorts. But in Region 6, fast-growing recreation, especially Winter Sports, greatly outweighed the slow-growing recreation.

A region's competitive recreation position is revealed by the regional competition column of table 3. Negative levels indicate that Regions 1, 4, 5, 6, and 9 lost competitive position between 1970 and 1989.

Table 3—Shift-share analysis of regional recreation growth, 1970-89

Region	Total change		National trend	Recreation mix	Regional competition
	Percent	RVD's			
----- Million RVD's -----					
1	30.9	3.1	4.7	0	-1.6
2	82.7	13.4	7.5	1.3	4.5
3	121.6	14.5	5.5	.1	8.9
4	47.9	9.0	8.7	.5	-.2
5	34.7	16.2	21.7	-2.1	-3.4
6	30.0	8.4	13.0	.4	-5.0
8	9.4	9.4	8.8	-1.1	1.8
9	13.8	2.8	9.4	.8	-7.4
10	201.3	3.1	.7	.1	2.3
Nation	46.3	79.9	—	—	—

Table 4—Recreation mix component of recreation growth, 1970–89

Recreation category	Region								
	1	2	3	4	5	6	8	9	10
	----- Million RVD's -----								
Camping	-0.6	-1.1	-1.0	-1.3	-3.9	-2.1	-1.4	-1.3	-0.1
Mechanized Travel	.7	1.1	.7	1.0	2.7	1.5	1.0	1.5	.1
Nonmechanized Travel	.4	.6	.6	1.0	1.6	1.5	.8	.9	.1
Fishing	-.4	-.6	-.3	-1.0	-1.3	-1.1	-.8	-.9	-.1
Resorts	-.4	-.6	-.6	-.8	-4.0	-1.5	-.4	-.4	0
Winter Sports	.3	1.7	.3	1.1	1.9	1.6	0	1.0	.1
Hunting	-.5	-.3	-.3	-.5	-.6	-.7	-1.2	-.7	-.1
Nature Study	0	0	0	.1	.1	.1	0	0	0
Other Activities	.5	.5	.7	.9	1.4	1.1	.8	.7	.1
Total	0	1.3	.1	.4	-2.1	.4	-1.2	.8	.1

Regions 2, 3, 8, and 10 gained. Regions gaining competitive position, gained more market share than they lost, even if the market share gained was in a slow-growing form of recreation. For example, a region could concentrate on slow-growing recreation (and have a negative recreation mix component), but have such an advantage in that type of recreation that it out-competes other regions (and has a positive regional competition component). Regions losing competitive position are those with recreation sectors growing slower than their national counterparts.

Table 5 provides a more detailed breakdown of the changes in competitive position. Most regions gained competitive position in some types of recreation and lost position in others. But Region 3 increased its competitive position in all categories of recreation, including Resorts, previously shown to be a slow-growing form of recreation. The "total" row of table 5 corresponds to the regional competition column of table 3.

The rows in table 5 reveal geographical shifts in competitive position for specific recreation activities. For example, the Camping recreation category is shifting away from Regions 1, 5, 6, 9, and 10, with the biggest shifts coming out of Region 5. This activity is concentrating in Regions 2, 3, 4, and 8, with Region 3 being the big gainer in competitive position. Similarly, Region 2 is the big gainer in winter sports and Region 6 the big loser. The advantage of evaluating geographical shifts in this way is that the regional competition measure is separated from the confusing influences of national trends and recreation mix.

DISCUSSION

This paper aims to demonstrate the feasibility and usefulness of shift-share analysis applied to recreation use. The analysis distinguishes between the roles of national trends, recreation mix, and regional

Table 5—Regional competition component of recreation growth, 1970–89

Recreation category	Region									
	1	2	3	4	5	6	8	9	10	
	----- Million RVD's -----									
Camping	−0.5	0.3	2.9	1.8	−4.3	0.1	0.7	−1.0	0	
Mechanized Travel	−1.2	1.3	4.2	−1.	2.7	−1.8	−.6	−5.4	1.9	
Nonmechanized Travel	.3	.4	.6	.1	−.5	−1.2	.6	−.3	.1	
Fishing	−.1	.2	.4	−.4	−.3	−1.1	.8	.2	.2	
Resorts	−.2	.1	0	.1	−.1	−.1	−.1	.2	.1	
Winter Sports	0	1.9	.2	−.4	0	−1.2	0	−.6	0	
Hunting	−.1	.4	.4	0	−.5	−.3	.4	−.3	0	
Nature Study	.1	0	0	0	−.2	−.2	.2	.1	0	
Other Activities	.1	−.1	.2	−.3	−.2	.8	−.2	−.3	0	
Total	−1.6	4.5	8.9	−.2	−3.4	−5.0	1.8	−7.4	2.3	

competition. But as with other regional science techniques relying on data aggregations (such as recreation categories), analysis results vary somewhat depending on the level of aggregation. Generally, finer levels of disaggregation tend to increase the amount of growth attributed to recreation mix and decrease that attributed to regional competition.

Nationally, recreation use increased by 46.3 percent between 1970 and 1989. Shift-share analysis revealed that this change was made up of numerous smaller changes involving regions and recreation categories. National trends often overwhelmed the other changes. Accordingly, national trends can be subtracted from total change yielding a "net" change, due entirely to the interaction of forces within and between regions. In this study, regional competition accounted for the bulk of these net changes.

Perhaps the biggest criticism of shift-share analysis is its inability to "explain" growth in some theoretical sense (see Houston 1967). Shift-share is not a behavioral model. Hence, shift-share analysis does not explain **why** recreation growth occurred in certain ways. Perhaps population shifts are responsible; perhaps changing tastes or land-use practices.

But Ashby (1968) maintains that shift-share doesn't claim behavioral underpinnings, only the ability to unravel complex growth patterns. Shift-share analysis reduces complicated sets of recreation use data to components of change that are more easily understood and interpreted. Although it does not explain regional recreation growth, shift-share analysis organizes information in a way that allows trends to be more readily discerned. Shift-share analysis helps bring order out of disorder, a noteworthy accomplishment.

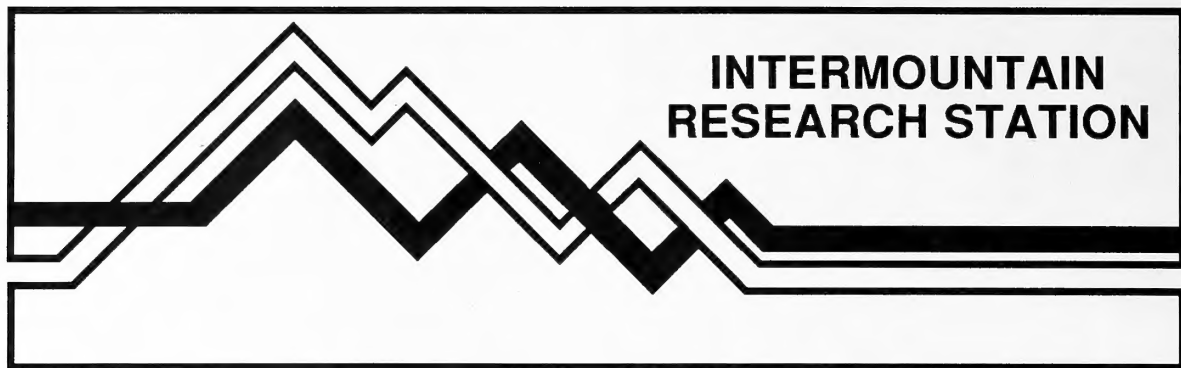
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